

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 July 2004 (01.07.2004)

PCT

(10) International Publication Number
WO 2004/055556 A1

(51) International Patent Classification⁷: **G02B 5/18, 27/00**

(21) International Application Number:
PCT/FI2003/000948

(22) International Filing Date:
12 December 2003 (12.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20022199 16 December 2002 (16.12.2002) FI

(71) Applicant (for all designated States except US): **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LEVOLA, Tapani** [FI/FI]; Hyhkynkatu 7 a, FIN-33270 Tampere (FI).

(74) Agent: **TAMPEREEN PATENTTITOIMISTO OY;** Hermiankatu 6, FIN-33720 Tampere (FI).

(81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, EG, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT (utility model), PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

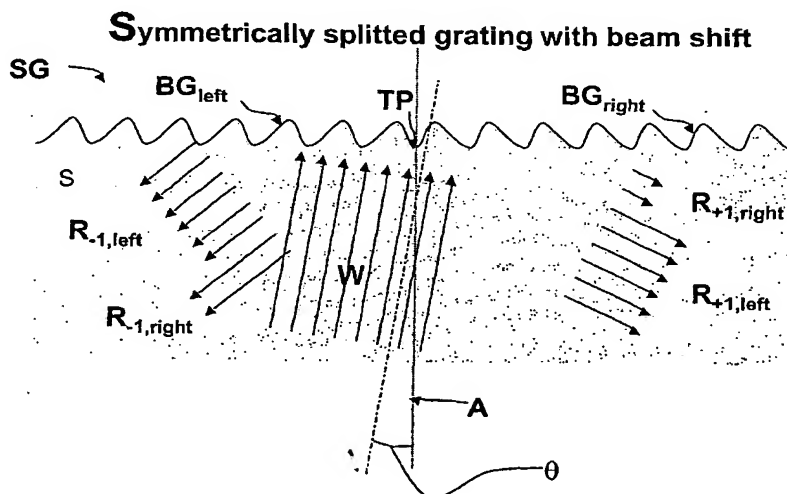
(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **DIFFRACTIVE GRATING ELEMENT FOR BALANCING DIFFRACTION EFFICIENCY**



(57) Abstract: The invention relates to a diffractive grating element arranged to be divided into at least two different grating regions (BG_{left}, BG_{right}; MBG_{left}, MBG_{right}) each having different diffractive properties and arranged on opposite sides respect to the transition point (TP) to form a splitted grating structure (SG). The diffractions generated by said at least two different grating regions are arranged to mutually compensate for the variation in the input angle (θ) of the incident light wave (W) to the total diffraction efficiency of the at least one diffracted light wave that is arranged to propagate within said substrate.